

NASA TECH BRIEF



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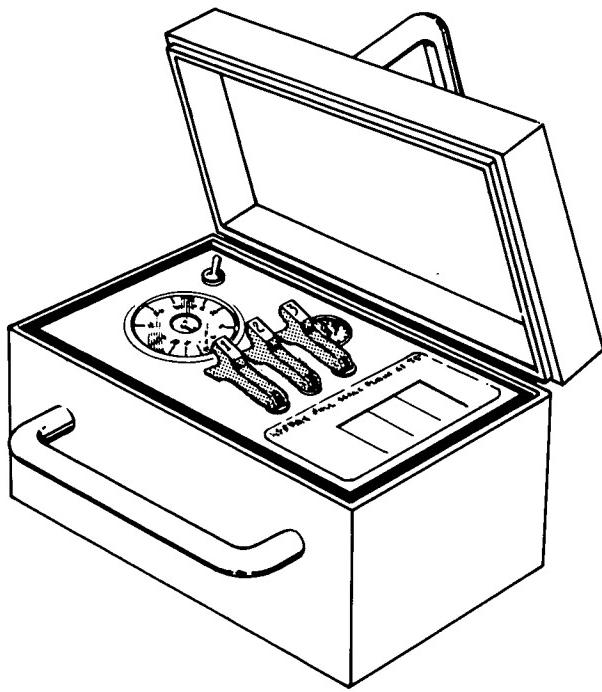
Gas Flowmeter

The problem:

Development of a mass flowmeter for measurement of the rates of flow of all common gases from purges and collected leaks at leak ports. Without dependence on gravity the meter had to measure rates between 5 and 650 cm³/min (standard) with pressures ranging from 1.333×10^{-1} to 1.333×10^{-11} N/m² (10^{-3} to 10^{-13} Torr) at ambient temperatures between 70° and 500°K; the gases were to be discharged into a void.

The solution:

Such a meter has been built and tested successfully with both nitrogen and helium; all specifications are



Configuration of Flowmeter

met or exceeded. It handles hydrogen, helium, nitrogen, oxygen, organic vapors, and other common gases; the principal characteristics are as follows:

Weight overall	~ 3.51 kg or 7.75 lb
Dimensions, handles and inlet included	
Length	31.7 cm or 12.5 in.
Width	23.5 cm or 9.25 in.
Height	21.6 cm or 8.5 in.
Ambient-temperature range	20° to 500°K
Max. operating back pressure to ensure	
Thermal insulation	1.333×10^{-1} N/m ² or 10^{-3} Torr
Metering accuracy	1.333 N/m ² or 10^{-2} Torr
Orifice pressure at full-scale flow	49.8×10^2 N/m ² or 20 in. H ₂ O
Battery	
Type	Storage, sealed silver-zinc, rechargeable
Number of cells	6
Voltage, full charge	~ 9 V
Recoverable full-charge energy	$\sim 7.9 \times 10^4$ J or 22 W-hr
Heat sink	
Type	Uses latent heat of crystallization of Na ₂ HPO ₄ · 12H ₂ O; rechargeable
Temperature range of crystallization phase change	306° to 322°K or 92° to 120°F

(continued overleaf)

Inlet connection 0.25 in.; female flare
 (AN)

Approximate full-scale at 297°K (75°F) [cubic centimeters (standard) per minute at 293°K (68°F), 10.13×10^4 N/m² (760 Torr)]; four gases through three orifices.

Gas	Orifice		
	1	2	3
Hydrogen	9500	850	270
Helium	7000	650	200
Nitrogen	2500	250	75
Oxygen	2400	225	70

Note:

The following documentation may be obtained from:

Clearinghouse for Federal Scientific
and Technical Information
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.65)

Reference:

NASA-TN-D-5517 (N70-12393), Flow-
meter for space

Patent status:

No patent action is contemplated by NASA.

Source: T. F. Morris and F. E. Wells
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